

# Detection of Number Plate using Yolo

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## ABSTRACT

This model is proposed to Automatically detect the number plate of vehicles. It uses YOLO (You Look Only Once) algorithm in order to detect the license plate. It takes the image as an input and puts it through Neural Network, then gives the output with bounding boxes. The method proposed here have some benefits over the traditional methods of detection of object. Yolo is really fast and efficient to handle detection of objects and it detects objects at a high speed up to 155 frames per second. Importance of automatically detecting number plate is that there are many fraud activities happening around us, to eliminate this mainly and then, also to retrieve vehicle details later after detecting the number plate. It detects the number plate and then make recognition or identify the license plate from the source image, which is called as image processing. This also works for number plates of different regions, it can detect for both grayscale as well as colour images. Also images can be captured by webcam and license plate can be detected. Number plates maybe broken sometimes, this model detects for broken ones also. It is also practical because of the low computational cost. It also has high accuracy and real time performance.

**KEYWORDS:** License Plate, Deep learning, YOLO (You Only Look Once), Neural Networks (NN)

## I. INTRODUCTION

Automatically detecting number plates is necessary in order to help the police force to reduce the threats and varieties of cheating activities that happen. This helps them to get hold of the people who violate rules, to find out stolen vehicles, if the vehicle is registered or not, for electronic toll collections. This process of detection is carried out by performing mainly four major steps. First one is getting the source image, then comes detection of the number plate, next is segmentation of the character present on the detected number plate and finally recognizing the character that is detected from the process. So first the image is preprocessed here. This is a name that is given to all the operations that is associated with images. The main aim of pre-processing is mainly concentrated on the fact of improving an image from the noise and other factors that distort the data. It simply improves the image data. It concentrates simply on detecting the number plate. Character segmentation as the word says is breaking it into smaller parts or subparts. Finally, the character on the license plate is recognized and that is what is called as character recognition. This model proposed here, can also detect images shown using the webcam and also the license plate of different countries can be detected easily. This model is user-friendly, image just need to be added manually or even using webcam you just need show the image it will capture the image and detect the number plate. Broken and dirty license plates also exist in real time, even those can be detected using this model.

## II. RELATED WORKS

A. The author proposed a model for the android phone users to identify the number plates automatically. The

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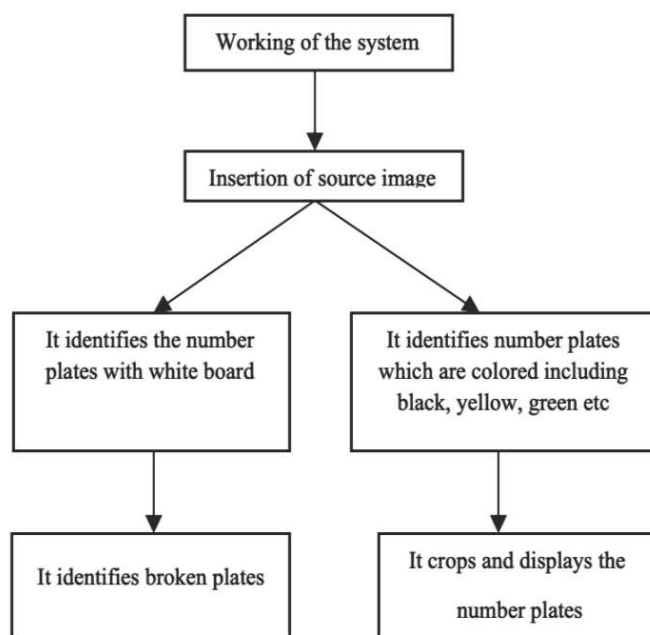
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- B. The model only used pre-processing as the main source hence it became more complex and also time consuming. The work used CNN and the metric of original image was considered as the criteria for pre-processing and recognition algorithms.
- C. This model concentrated on capturing the image of the vehicle and then recognizing it and retrieving the details of the owner along with it. The accuracy and correctness of the model was low because it was not possible to do it for all the users. The model created GUI interface to display the results.
- D. The author proposed here a Digital Image Processing algorithm. This model was limited only to Nigerian vehicles.
- E. The proposed system was developed using MATLAB where the image was captured and then it was converted to grayscale in-order to be pre-processed. Because of Image pre-processing and also of other hardware requirements there were some limitations to the method that was proposed. Mainly implemented to recognize the plate of a car parked at the gate in parking area.

### III. WORKING METHODOLOGY

In this model the main is to identify the number plate and detect the number on the license plate. It is very useful for traffic police to identify the vehicles to mark some fraud activities that happen. Human beings always want everything to be done automatically, so detecting of objects makes it easy for us to find out solutions to different problems. YOLO (You Look Only Once). This algorithm is based mainly on regression, and also instead of completely selecting the image it predicts the object in the image which we want to select in bounding boxes in one run of the algorithm. Implementation of this model is using YOLO or You look Only Once. It is faster, easier and efficient to use. It detects the number plate after the image is added and displays the image with bounding box around the number plate. Another feature is that if the image is shown to the web camera it detects the image and also the license plate will be detected. Number plates can be of different color, shape, size and language, it detects the number plate of different countries which is a major drawback in many methods which are already proposed.



**Fig 1.1: Working of the proposed system**

Two main working of the proposed system is describes in Fig 1.1. YOLO is a real time object detection method What happens in this method is that the neural network is being applied to the source image. Single image is broken into different frames and then the prediction of the boundary box is done. It is by classification model that predictive values detect the object. The working of the proposed model is by dividing it into two parts and they are by identifying the number plates based on the source image inserted or added into the model. So at first, the image will be checked for the number plates with white background because the system need to detect both colored as well as white number plates. After seeing the image and detecting the vehicle and then identifying the number plate is done first.

Then the number plate is identified. If the number plate is white in colour it will be detected and marked within bounding box. It also checks if the license plate is broken or not. Here we are using the blob detection to identify these kind of number plates. Difference in background and also brightness variation will also affect the detection process. The main aim of using this approach is to find the complimentary regions which are not detected by the edge

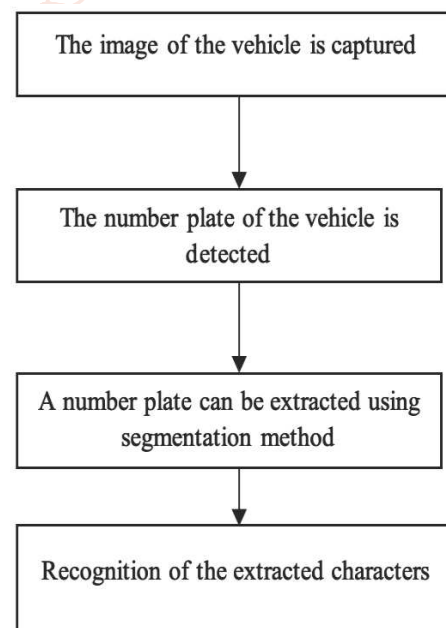
detection or corner detection algorithm. It also detects the broke number plate. The next part of the model is to identify the number plates which are colored for example yellow, black and more. It will then detect the plate and after marking the bounding box it will show the cropped number plate with the help of optical character recognition.

### IV. PROPOSED SYSTEM

The proposed system uses YOLO(You Look Only Once) algorithm to detect the objects in a single frame. Then what the algorithm does is that it detects the object to be recognised in bounding box and identifies.

The algorithm is divided in mainly into 4 steps: They are capturing the vehicle image, detecting the license plate of the vehicle , segmentation of the characters in the license plate and also then recognising the characters in the license plate after segmentation .

1. Vehicle image capture: Capturing image of the vehicle is the first step in the process of license plate detection. Without the source image detection of number plate cannot be done.
2. Vehicle Number Plate Detection: Detection of the number plate has many factors to be considered before it is done. Detection of the number plate is done by the YOLO algorithm. In this step the located number plate is detected. Detecting the edges and sides of the number plate is sometimes not much accurate. In order to detect complex edges and complimentary regions blob detection is used. They are:
  - A. Locating the license plate: This locates the license plate the vehicle which exists in the image captured or from the source image. It locates the place where the license plate is located in the vehicle for further identification.
  - B. Size of the number plate: Number plates can be of different sizes and colours. This also plays a major role in detecting the license plate. Size differs on how the image is captured.



**Fig 1.2 Flow of work**

- C. Background of the plate: Background color of the plate will be different for different vehicles of different countries. Color of the number plate may differ from

white, yellow, green or to some other color. Hence it is also an important factor.

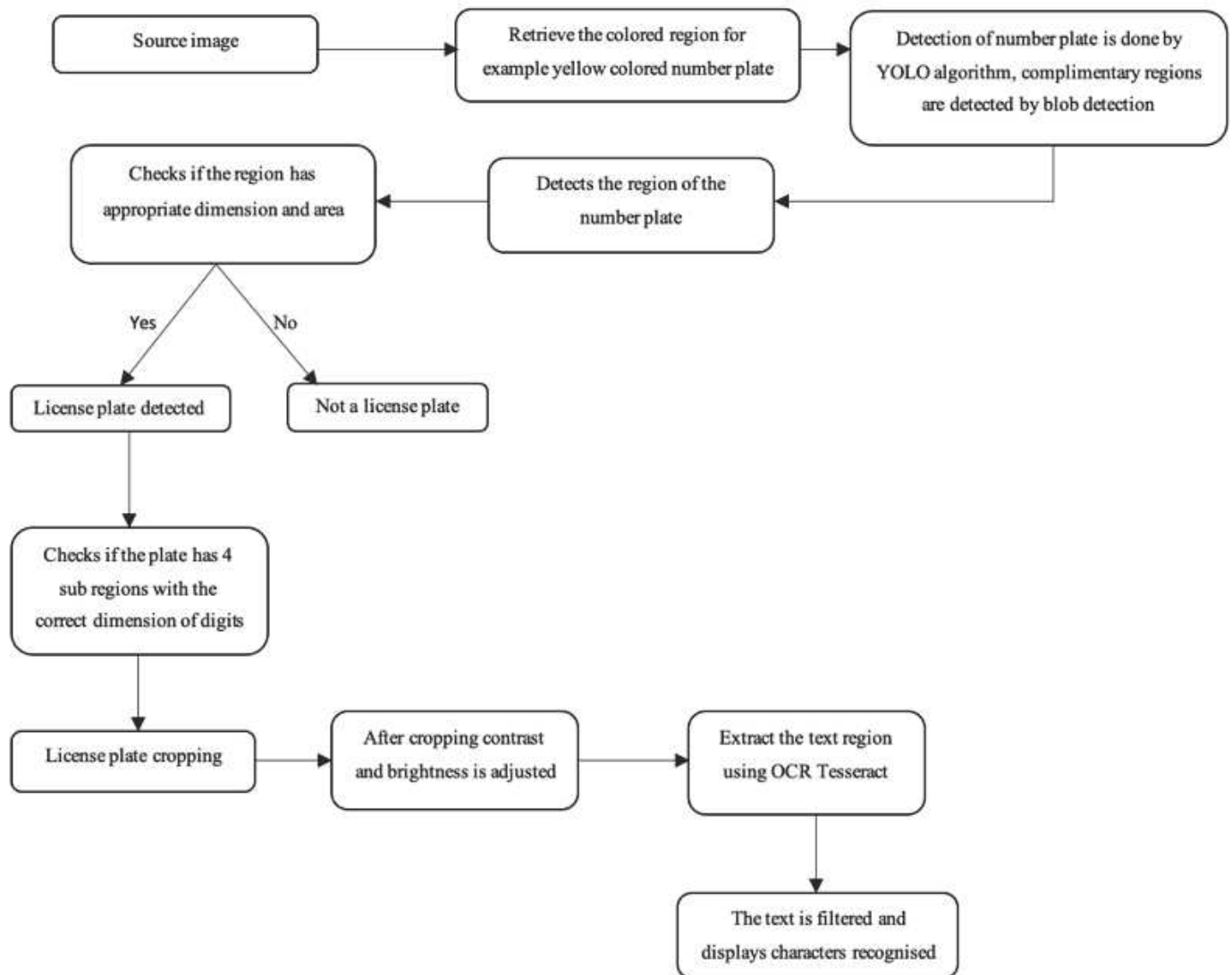
- D. Screw of the license plate: A number plate will have screws attached to it. Sometimes this can be confused as a character.
3. Segmentation of character on license plate: Segmentation of characters can be done using this segmentation method. Extraction of characters is actually considered as one of the difficult task as there are factors that will affect the extraction. Blob detection is also used in order to detect points or regions that differ in brightness or color as compared to surrounding. This will help to find complimentary

regions which are not detected by edge detection or corner detection algorithm.

4. Character Recognition: Our model after segmentation recognize the number plate and mark them within bounding box. It will also handle ambiguous and also noisy data from the prediction.

It can identify the characters automatically based on the training data. From this the characters are recognized. Our method also recognizes broken number plates as well as the one with dirt and low sunlight. The number plate is morphed using morphology technique. The recognised and cropped number plate will be detected and displayed separately. This will be converted to greyscale.

## V. ARCHITECTURE



**Fig 1.3 Architecture diagram of the proposed system**

The architecture diagram is used to make the proposed system easier to understand and get a clear outline of the working of the system. It shows how developed the system is. The below diagram is the architecture of the system proposed here. Source image is obtained from the system or captured using webcam in order to test the vehicle image. Then the coloured region of the number plate is recognised, it may be yellow, white, green or any. Using the YOLO algorithm the number plate is detected very easily because the algorithm only simply means You Look Only Once. The detected number plate is easily shown by bounding boxes around them.

But some edges maybe complex in nature. It may be difficult to detect the edges sometimes using edge detection, therefore for detecting the complimentary regions blob detection is used. Then after this it detects the region of the number plate. If it has the appropriate dimension and area of a number plate it will detect that it is a license plate, else it will not detect the plate. If the licence plate is having four sub regions, as that is the format of the license plate, then it will go to the next step. The next step is to crop the detected plate. For cropping there are some factors like the contrast should be adjusted and even the brightness. Hence this is done. Using the optical character recognition using tesseract

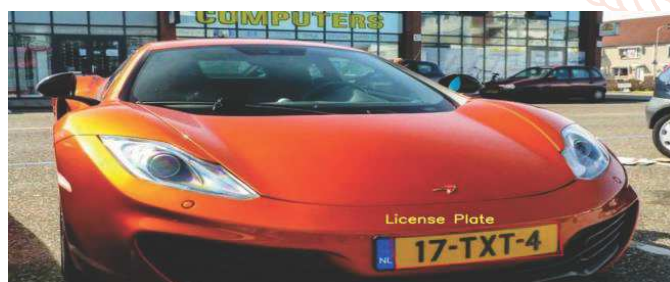
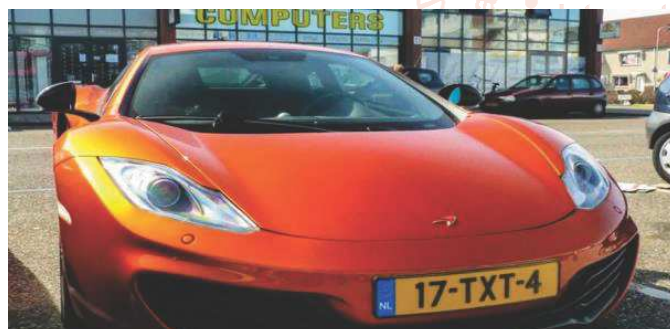


the region of the number plate is extracted. Then text filtering is done and finally the number plate will be displayed after cropping and text filtering.

## VI. RESULT AND DISCUSSION

Number plates have been tested with different background color, broken ones and for different countries also for the proposed method. Use of YOLO made it easy to implement this detection system for number plate. It helped in increasing accuracy rate, less complex than MATLAB and other methods. The method focuses mainly on two varieties that is: first one is for number plates that have white background and it will also detect for the broken ones as well as normal ones, and the second one for the colored number plates like red, green, black etc. Images can also be added normally to the proposed method or can be captured using web camera also.

Fig 1.4 shows the result obtained by running the model. First the captured image is shown which is called as the source image. The image is then gone through the detection process and license plate is recognised and as shown in the figure bounding boxes appear around the license plate. After this the detected plate is cropped by using morphology technique. Then the cropped plate is taken and the characters are recognised by tesseract and optical character recognition. This is done order to detect the coloured number plates. In Fig 1.5 the images shows the broken plate of the vehicle that is displayed. The method proposed identifies white colored number plates, also broken plates. The figure clearly shows the broken plate that is bounded by box around them.



**Fig.1.4 Output 1: Detecting yellow number plate**



**Fig 1.5 Output 2: Detecting broken number plate**

## VII. FUTURE SCOPE

This model can be further improved by adding video files for checking the license plate. The model proposed here actually have the ability to run videos and detect the number plate, but because of privacy issues videos cannot be added and detected. This can be added for future use. We can also make it more user friendly by adding more images to the system and selecting from it in a random way. This can be made more efficient by adding different types of neural network algorithms to it. Multiple algorithms can be checked to identify which is more suitable. And compare which gives more accuracy to detect the license plate easily and with less time.

## VIII. CONCLUSION

It has always been a difficult task to identify vehicles on a busy road, as the number of vehicles is increasing day by day. It can monitor vehicles that exceed the speed limit, also other cheating and fraud issues can be solved. Automatic License Plate Recognition system allows to detect the number plate, this will help the cops to solve problems regarding to road. By just inserting source image we can run the data. This model proposed here has been efficient to recognise the license plates that were broken, of different countries and also the images shown using webcam. This provides high accuracy, low computational cost and also an efficient system to detect the vehicles. The model here is also able to detect plates of different sizes and colours, conditions like sunlight, darkness and shadows, bad weather conditions and broken ones.

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